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depth of eighteen feet; and eight feet below, two phalanges of a rhinoceros."

Other discoveries, made since 1860, and well known to our readers, are alluded to. The writer might have added the case, now apparently well authenticated, of the human skull found by Professor Whitney, under Table Mountain, California, associated with remains of the mastodon.

FRESH DISCOVERIES OF PLATYCNEMIC MEN IN DENBIGHSHIRE.— Mr. W. Boyd Dawkins records in "Nature" the opening of some freshly discovered bone-caves in Denbighshire, Wales, in which were discovered the remains of men with the skulls rather above than below the present ordinary cranial capacity, but with some of the leg-bones remarkable for the peculiar antero-posterior flattening or platycnemism of the shin bones. They are associated with the remains of sheep or goat, pig, fox, badger and stag, and with four flint flakes. The interest of the discovery consists in the fact that the group of caves, which has been used by a race of herdsmen in long-forgotten times as habitations and burial places, must be referred to the Neolithic age. And we can now be certain that those people who have manifested the peculiar flattening forwards of the shin in Denbighshire belong to that age. It is a point also well worthy of note that the cranial capacity of these Neolithic men was not inferior to that of the average civilized man, although the ridges and processes for muscles indicated a greater physical power.—A. W. B.

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## GEOLOGY.

GEOLOGICAL EXPEDITION TO KANSAS.—I write to give a brief account of the expedition of seventeen days which I have just made in the valley of the Smoky Hill river in Kansas. Through the courtesy of General John Pope commanding the department of the Missouri, I was furnished with an order on the post commandant at Fort Wallace for a suitable escort. This was furnished by Captain E. Butler (Fifth infantry), who spared no pains to make the expedition a success.

We first camped at a spring eighteen miles south of Fort Wallace, and five miles south of Butte Creek. It had a fine flow of water, and being without a name I called it Fossil Spring. On a bluff on Butte Creek, Lieutenant Whitten discovered the fragments of a monster saurian projecting from the shale, and on following the bones into the hill, exhumed a large part of the skeleton of a *Liodon dyspelor* Cope. This was welcome, as the species had been previously known from vertebræ only. The pelvic arch was found perfectly preserved, and the scapular arch and limbs partially so. The iliac bone is slender and straight, slightly expanded at the acetabulum. The ischium has a some what similar form, but is curved. The axis of the proximal portion is directed upwards, the shaft then turns into a horizontal direction and lies beneath and at one side of the vertebral column without uniting with its fellow. The pubes are elongate, but wider than the other elements and flattened. They are in contact in front medially, and have an angulate axis. A short process projects from near the proximal end, on the exterior margin. The femur is a flat bone slightly constricted medially, and with a decurved and projecting portion of the proximal articular surface on the *inner side* representing a head. The extremities of the dentary bones are each drawn to an acute point differing thus *toto cœlo* from those of the *L. proriger.*

On the same bluff another Liodon and a Clidastes were found with five species of fishes.

On examining the neighboring bluff and denuded areas, bones supposed to be those of Pterodactyle, two species of Clidastes, a Dinosaur, a Crocodile, and numerous fishes were brought to light.

In a similar location on Fox creek cañon, one of the escort, Martin V. Hartwell, to whom I am indebted for many fine discoveries, observed the almost entire skeleton of a large fish, furnished with an uncommonly powerful offensive dentition. The jaws were stout, the dentary bone very deep. The teeth in a single row in all the bones, but of irregular sizes. There are two or three very large canines in each maxillary and one in the premaxillary; three or four in the dentary separated by one interval. The lack of the coronoid bone and many other characters, shows that it should be referred to the order Isospondyli, and is probably allied to the herring and the Saurodontidæ. The vertebræ are grooved, and there is a basioccipital tube but little developed. The teeth are simple cylindric conic, with smooth enamel, and project two inches above the alveolar border, and each descends an inch into its alveolus. The species and genus are new to our palæontology, and may be named *Portheus molossus.* It turned out on subsequent explanation to have been quite abundant in the

Cretaceous seas. It was probably the dread of its cotemporaries among the fishes as well as the smaller saurians.

On another occasion we detected unusually attenuated bones projecting from the side of a low bluff of yellow chalk, and some pains were taken to uncover them. They were found to belong to a singular reptile of affinities perhaps to the Testudinata, this point remaining uncertain. Instead of being expanded into a carapace, the ribs are slender and flat. The tubercular portion is expanded into a transverse shield to beyond the capitular articulation, which thus projects as it were in the midst of a flat plate. These plates have radiating lines of growth to the circumference, which is dentate. Above each rib was a large flat ossification of much tenuity, and digitate on the margins, which appear to represent the dermo-ossification of the tortoises. Two of these bones were recovered, each two feet across. The femur resembles in some measure that ascribed by Leidy to *Platecarpus tympaniticus*, while the phalanges are of great size. Those of one series measure eight inches and a half in length, and are very stout, indicating a length of limb of seven feet at least. The whole expanse would thus be beyond twenty feet if estimated on a Chelonian basis. The proper reference of this species cannot now be made, but both it and the genus are clearly new to science, and its affinities not very near to those known. Not the least of its peculiarities is the great tenuity of all the bones. It may be called *Protostega gigas.*

The greater part of a large *Liodon proriger* Cope was found scattered over a denuded surface at one point, his huge, truncate bowsprit-like snout betraying his individuality at once. Portions of other examples of this reptile were afterwards found. Remains of several species of Clidastes occurred at various points in the neighborhood of Fossil spring. One (*C. dux* sp. n.) was found in the side of a bluff fifty feet above the bottom of the cañon; Martin Hartwell exhumed another near the *C. cineriarum* Cope almost complete.

We subsequently left this locality and encamped at Russell springs on the Smoky Hill, twenty-six miles distant. On the way a large Clidastes of some forty or more feet in length was found lying on a knoll of shale, with the head displaying the palatal surface upwards. On the Smoky our explorations were attended with success. When we shifted camp, it was to go to Eagle Tail in Colorado, whence we returned again to Fossil Spring. The richness of this locality was again apparent, and we added to our collection a number of species, among these may be mentioned *Liodon ictericus* Cope and a new Clidastes.

The writer originally pointed out the existence of representatives of the orders Pythonomorpha and Sauropterygia, in this Cretaceous basin. Prof. Marsh's explorations determined the existence of Ornithosauria and Crocodilia. The present investigation adds Dinosauria and perhaps Testudinata, or the group the new form Protostega Cope, represents.

The preceding account expresses some points of interest observed. These with others now unnoticed will be included in a final report.

The giants of this sea were the *Liodon proriger* Cope, *L. dyspelor* Cope, *Polycotylus latipinnis* Cope, and *Elasmosaurus platyurus* Cope. Of these the first was apparently the most abundant. The second was the most elongate, exceeding in length perhaps any other known reptile. The last named had the most massive body, and exhibited the most extraordinary appearance in consequence of the great length of its neck.

For kind assistance I am much indebted to Captain Edwin Butler post commandant at Fort Wallace; to Dr. W. H. King post surgeon; and to Captain Wyllys Lyman. To Lieutenant James H. Whitten and Sergeant W. Gardiner who accompanied the expedition much of its success is also due. — EDWARD D. COPE, *Fort Wallace*, *Kansas*, *Oct. 9th*, 1871.

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## MICROSCOPY.

AHRENS' BINOCULAR.—This instrument, the fourth new binocular brought forward within a few months, was submitted to the Royal Microscopical Society, of London, on the eighth of February last. It is applicable mainly to high powers, being manifestly unable to compete with Wenham's arrangement for low powers. It naturally stands in comparison with the contrivances of Mr. Tolles and President Barnard. Like Dr. Barnard's, which was published some months previously, it separates the light above the objective into two pencils by double refraction by means of Iceland spar, cut and cemented in a somewhat complicated and difficult manner. In other respects the two instruments are entirely different. In the new arrangement the pencils of light pass upward from the prism